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Bibliometric Analysis and Visualization of Bone Health in Post Menopausal Women of the Articles Published in Scopus

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ABSTRACT

To provide data reference for intuitive and convenient understanding of post-menopausal women's research, the relevant literature from 2006 to 2026, were collected in the critical journals of the Scopus full-text database. This paper uses bibliometrics to analyse the number of papers published, authors and research direction, research institutions distribution, source journals distribution, funding support and most prolific countries and authors. Then, the VOS viewer software was used for creating a co-authorship network map, inter-country co-authorship network map, Co-occurrence of keywords and most cited authors. A total of 832 papers were included, and the number of literatures decreased before and increased after**.** The number of papers exponentially increased from 63 to 105 from the year 2021 to 2025. United States of America tops the list with 218 total papers. Among the Universities Monash University (21 times), University of Pittsburgh and University of Toronto (15 times), Monash Health (14 times), Purdue University (12 times) are the most frequent publishing institutions. The fund project support of various Health Institutes, Research Centres, pharmaceutical companies and universities is relatively strong. It was found that the most prolific author is Milat F. with 9 publications. This study contributes to the existing literature on Post Menopausal Women. A much comprehensive and reliable picture of this area is provided using the bibliometric techniques. The results can help in guiding the authors interested in conducting future research on this topic.

Keywords: Menopause, Bone Health, Osteoporosis, Bibliometric analysis, VOS viewer

INTRODUCTION

Osteoporosis is a skeletal disorder characterized by decreased bone strength that increases the fracture risk at instances of trivial trauma. With increased life expectancy, the world is going to witness an unprecedented surge in the geriatric population and increase in osteoporosis related morbidity. India currently has 10% of its population over 50 years. Emerging population trends based on 2011 census show, 22% of our people falling in the geriatric age group by 2025, and 33% by 2050. 46 millions of Indian women above the age of 50 years (20%) are believed to be osteoporotic (Jackson *et al.,* 2023).

Osteoporosis is a major public health problem. We now have an approach to case finding that involves the measurement of bone mineral density in people at high risk of fractures. The management of the individual includes the identification of risk factors, the choice of optimal therapy and the encouragement of long-term adherence with the planned treatment. The drugs that are available for the prevention of fractures are classed as anticatabolic or anabolic. The efficacy of these agents can be evaluated in the individual by monitoring changes in bone mineral density or bone turnover markers (Liu *et al.,* 2011).

The bibliometric method is used to retrieve and analyse the literature related to bone health in post-menopausal women published from 2006 to 2026 in Scopus. This paper hopes to sort out the development context and research frontiers of relevant research through data mining to lay a foundation for the continuous

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research on bone health of post-menopausal women and provide data reference for intuitive and convenient cognition of the focus of post-menopausal women.

METHODOLOGY

In this study, a bibliometric analysis is conducted with a purpose to analyse the research from the year 2006 to 2026. A bibliometric analysis is often employed to deduce the quantitative changes in a particular research discipline, to ascertain the pattern of publications on a particular topic, and for discovering the publication propensity within a certain discipline (Lee and Hew, 2017; De Bakker *et al.,* 2005). The results of such analysis offer information which is practical, useful and timely for both professionals and experts who are interested in appraising such scientific activity (Duque Oliva *et al.*, 2006).

Database chosen for this study is Scopus published from the year 2006 to 2026. This database was chosen because of its wider coverage of good journals. The keywords "Post menopausal and Bone Health" were used for searching papers. The search filter was applied to find only such papers which contained the keywords in either their title or abstract or keywords.

The search reflected a total of 832 papers. Further, a classification of these papers is provided on the basis of:

- Year wise publication;
- Funding Sponsors;
- Most prolific authors;
- Most prolific countries and institutions;
- Document type;
- Subject Area

For co-authorship network analysis, inter country co-authorship network analysis and keywords co-occurrences network analysis, the VOS Viewer 1.6.9 software was used.

VOS viewer is a free software tool which is used for creating maps based on network data. It also helps in visualising and exploring these maps.

RESULTS AND DISCUSSION

In this section, a bibliometric analysis and VOS viewer analysis is presented on the basis of different performance indicators. The Scopus database search showed 832 articles published with 159 authors with 159 institutions and 80 different countries. In this way, it is possible to answer the research questions of this study. In this section, the chronological evolutions of the papers published by years, most prolific authors, type of document published, the institutions and the countries of the authors, the journals and author with a larger number of papers and citations, and the paper with the largest number of citations are analysed.

Year wise publication of papers:

Fig. 1 shows the number of papers published from the year 2006 to 2026. It can be seen that the research on Post Menopausal Women has been growing over the years. The number of published papers was very minimal during the years 2006 to 2010. Then, there was an impressive increase from the year 2011 to 2018, the number of papers rose from 29 to 46. Further, it can be seen that maximum papers have been published in the

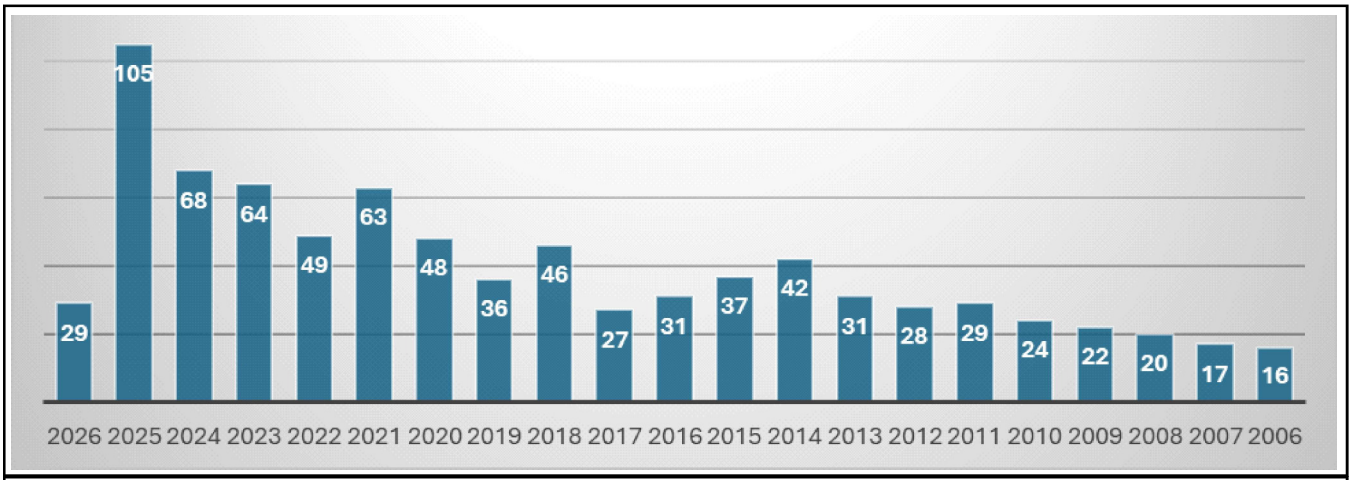

Fig. 1 : Year wise publication of Papers

last five years. The number of papers exponentially increased from 63 to 105 from the year 2021 to 2025. This clearly shows that the interest of researchers has grown tremendously towards this field, in the recent times.

Most prolific countries:

Fig. 2. All the papers in this study belong to their respective authors of 80 different countries. Fig. 2 shows the top 26 countries with maximum number of papers on Post Menopausal Women. The country of the first author was recognised as the country of origin for the paper. United States of America tops the list with 218 total papers. UK, Italy, China, Australia, Canada and India are the next top countries with maximum papers. It is worth noticing that out of 832 papers in the study; more than half of the total papers are contributed by the authors of the top five countries.

Most prolific authors:

Fig. 3 shows the top ten most prolific authors. All the 832 papers in the study belong to their respective 159 authors. Upon analysing the data, a list of the top ten authors with maximum publications was prepared. Further, it was found that the most prolific author is *Milat F.* with 9 publications followed by *Vincent A.J* and *Weaver C.M* with 8 publications and *Hadji P.* with 7 publications.

Most Prolific Affiliations/ Institutions:

Fig. 4 shows the most prolific institutions in the world. In the literature on Bone Health in Post Menopausal women, with higher number of issued papers are shown in the graph. Among them *Monash University* (21 times), *University of Pittsburgh* and *University of Toronto* (15 times), *Monash Health* (14 times), *Purdue University* (12 times). From the analysis results, it can be seen that

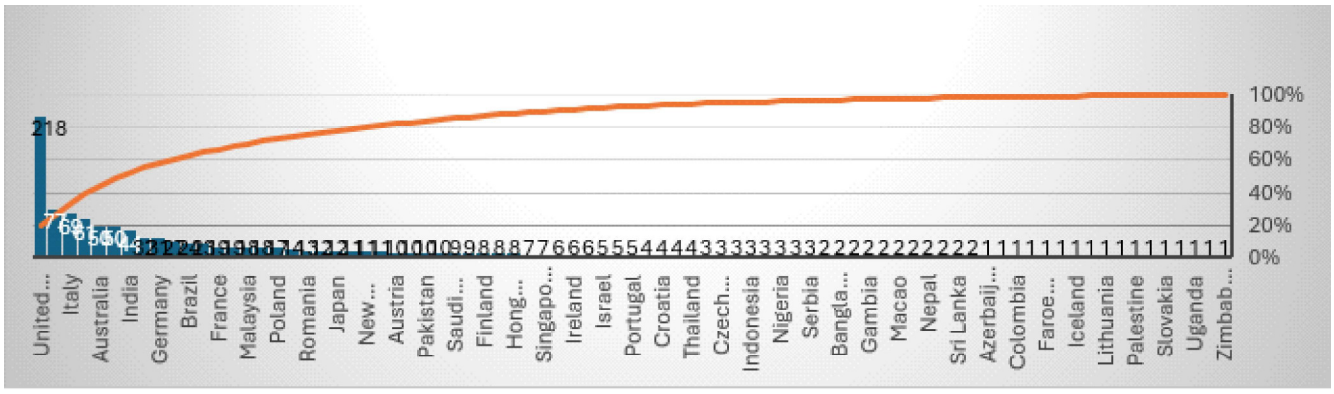

Fig. 2 : Most prolific Countries

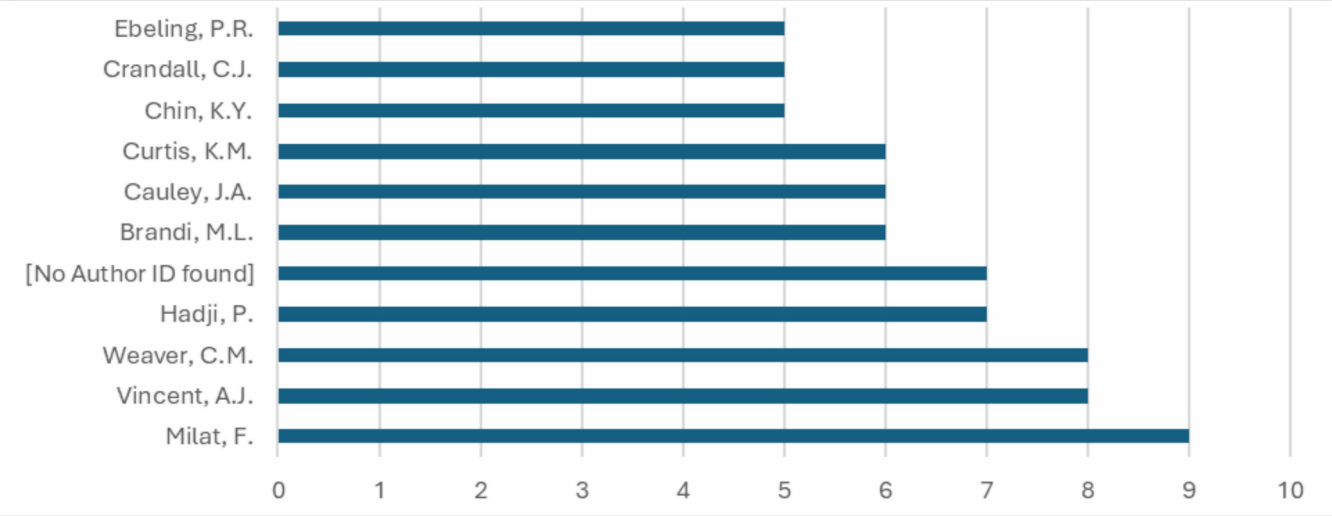

Fig. 3 : Most Prolific top ten authors

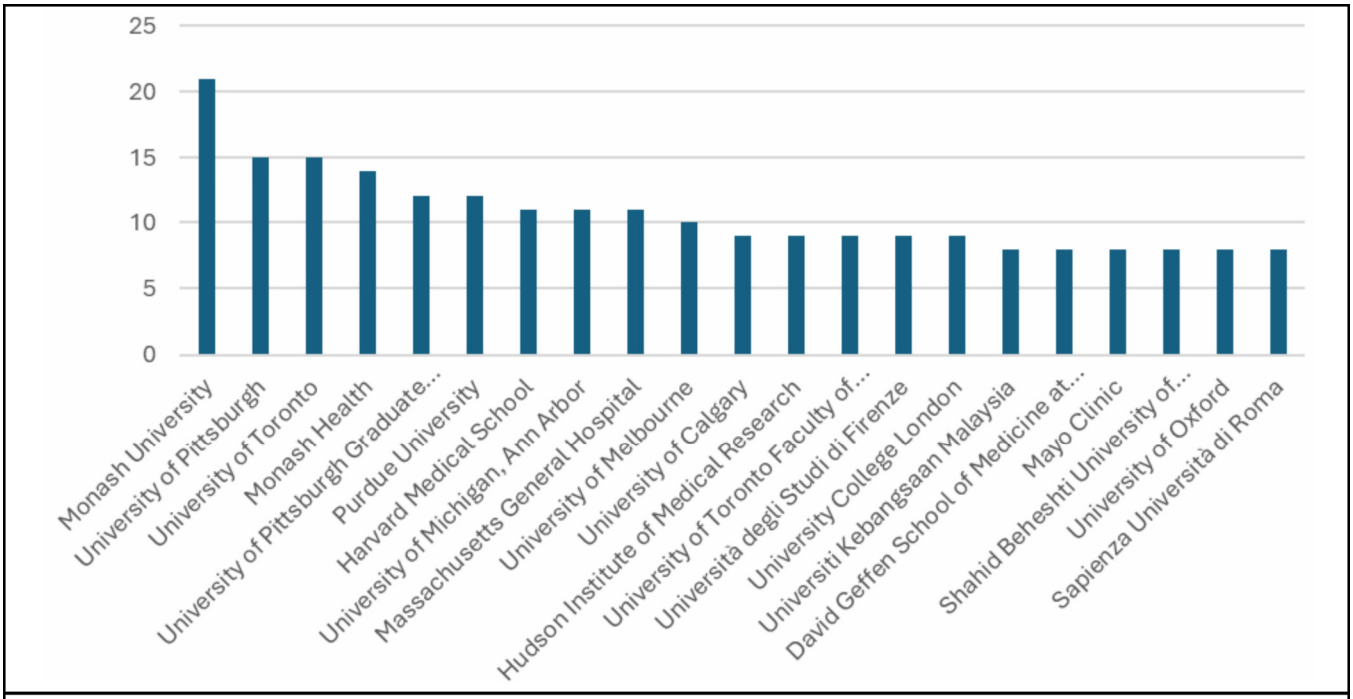

Fig. 4 : Most prolific Affiliations / Institutions

the research institutions are mainly comprehensive universities and some normal universities which has a more in-depth relationship with more major and more complex situation.

Funding Sponsors:

Fig. 5. Based on the analysis of the research literature's funding situation, there are 159 different kinds of projects supporting the research, and the support is still strong (Fig. 5). These funds include *National*

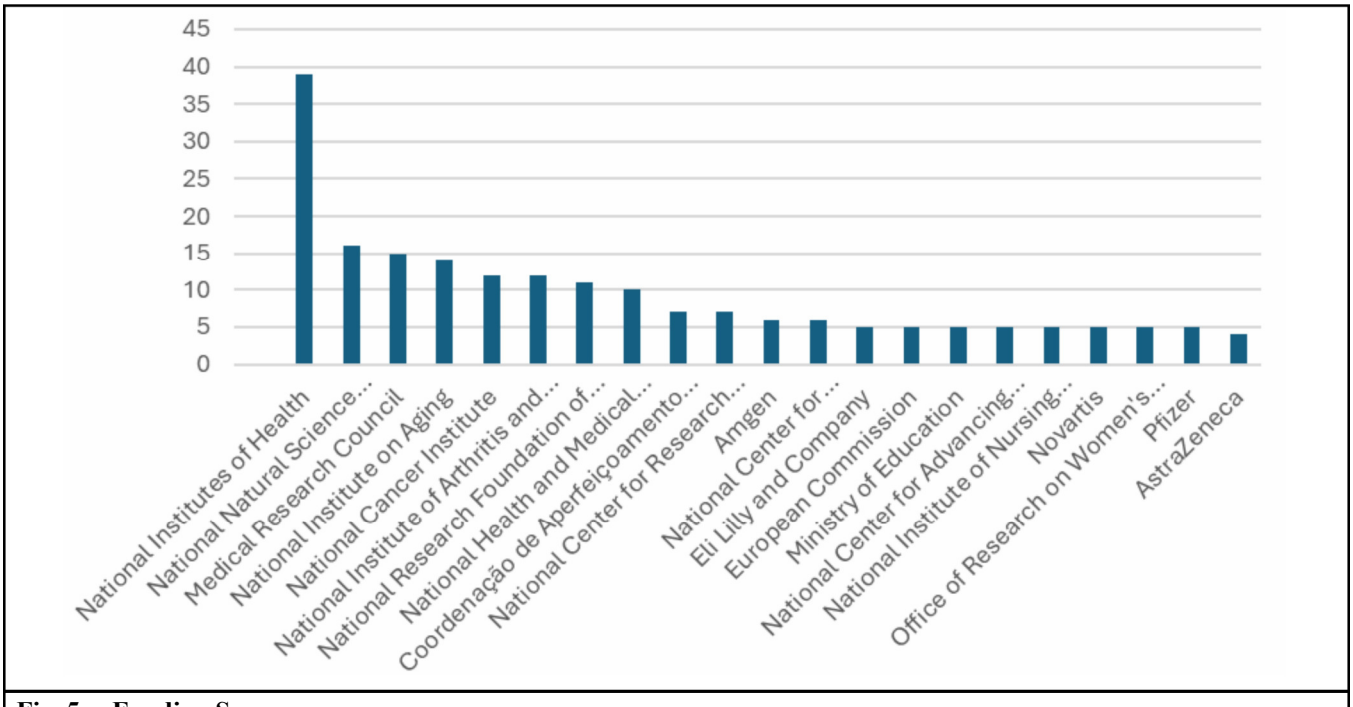

Fig. 5 : Funding Sponsors

Institutes of Health (39 items*), National Natural Science Foundation* (16 items), *Medical Research Council* (15 items), *National Institute on Aging* (14 items*), National Cancer Institute* (12 items). Overall, each province's fund investment is the largest, followed by the universities fund support.

Document Type:

Fig. 6. In accordance with the table; Dominance of original research *Articles (497)* make up the majority indicates strong emphasis on primary research output. *Reviews (244)* are the second largest category suggests a mature research field and active synthesis of existing knowledge. *Book Chapters (48)* reflects academic and educational contributions *Conference Papers (15)* are relatively low, meaning limited emphasis on early-stage or technical dissemination. *Editorials, notes, letters*, and *short surveys* are present but minimal these usually represent commentary, brief findings, or opinions. Only *1 Retracted paper* suggests generally stable research quality.

Subject wise number of Publications:

Fig.7 shows the number of publications in various

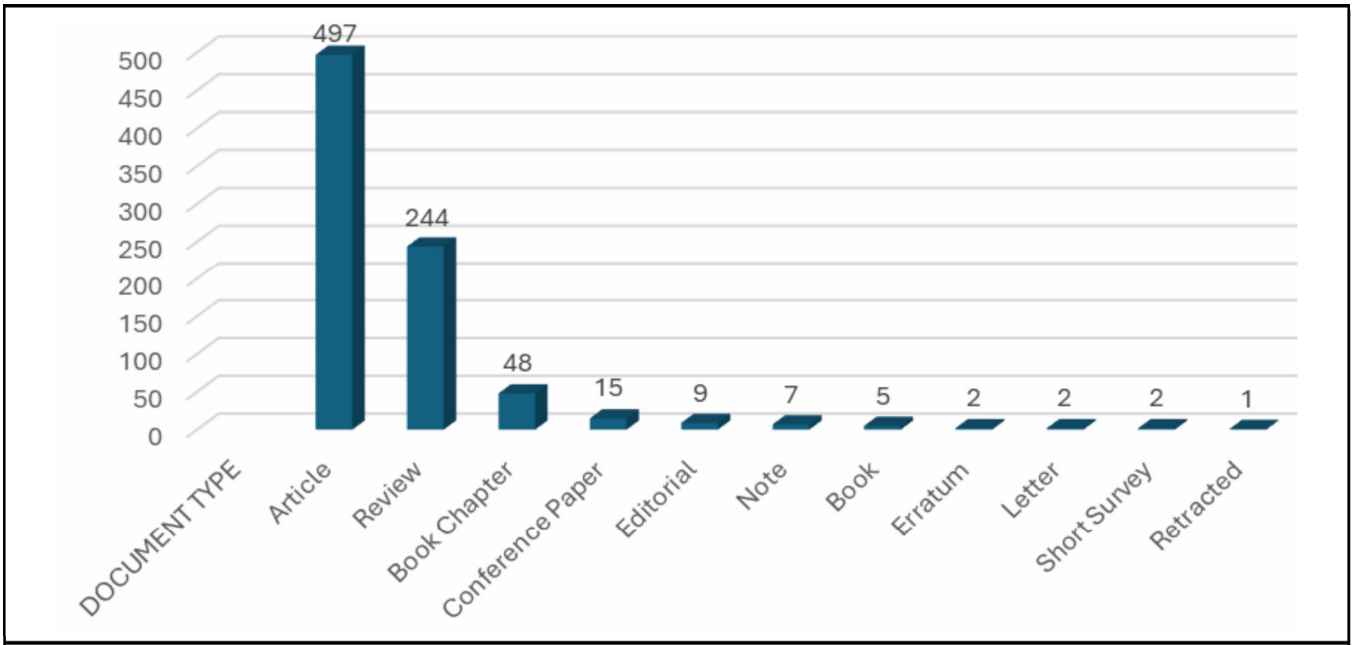

Fig. 6 : Document type Publications

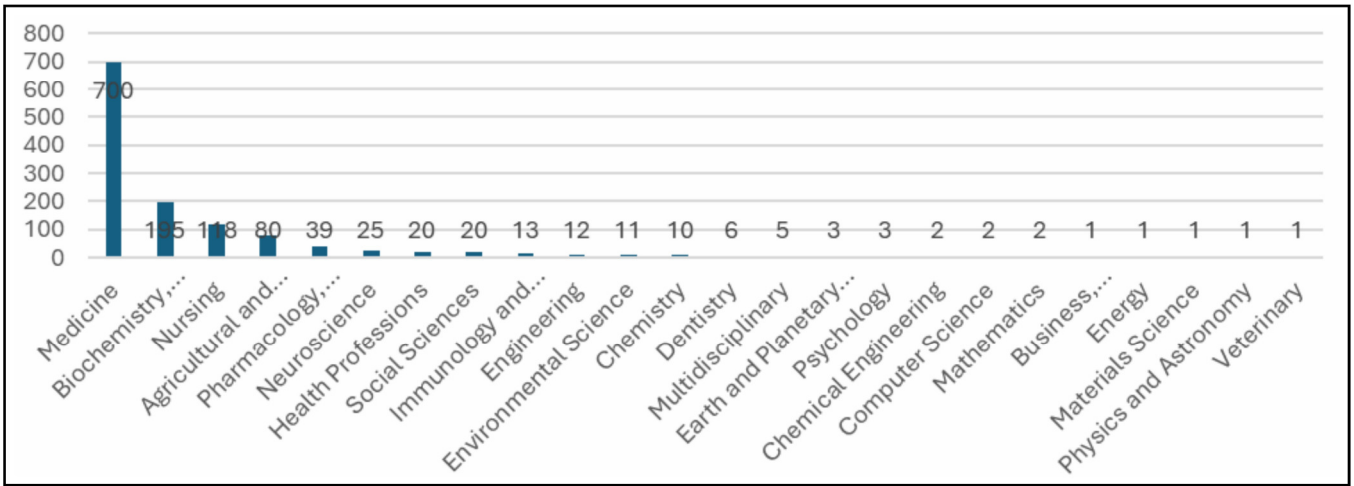

Fig. 7 : Subject wise number of Publications

streams, with highest in *Medicine* field which goes up to 700 clearly leads by a large margin (~3.5 x more than the next field). Life sciences fields like *Biochemistry*, *Nursing*, and *Agricultural and Biological Sciences* form the core supporting areas with 195 publications. Fields like *Pharmacology*, *Neuroscience*, and *Health Professions* suggest a healthcare-focused dataset with moderate representation. Technical and quantitative fields (*Engineering*, *Computer Science*, *Mathematics*) are minimally present.

Co-authorship network analysis:

In this study, a co-authorship network analysis is conducted by using the VOS viewer 1.6.9 software. VOS viewer is a programme that is used for creating and viewing bibliometric maps. It can be used to create maps of journals or authors based on the co-citation data or to create maps of keywords based on the co-occurrence data (Van Eck *et al.*, 2010). VOS stands for Visualisation of Similarities. For constructing a map, the software applies the VOS mapping technique (Van Eck and Waltman, 2007). The co-authorship network analysis is used to visualise the co-authorship networks among the various authors, and to find out which authors have co-authored with the maximum number of other authors in the data set (Fig. 8).

This network visualization shows the collaboration patterns between the 69 authors identified in the 10 publications. 279 unique pairs of researchers have collaborated. Several large clusters are visible, notably those associated with the multi-authored Chinese publications (e.g., authors like Jiang J., Zhou Y., and Chen Y.). To create a network map, the software selected only those authors who had co-authored with at least two other authors in the data set.

Inter country co-authorship network analysis:

In this section, the inter country co-authorship network analysis is discussed (Fig. 9). This analysis is done to find out that which countries' authors have co-authored with the maximum number of authors from the other countries. Based on the 10 records provided in the dataset, the country affiliations and identified collaborations between different nations. *China* (4 publications) and *India* (3 publications) are the most frequent contributors in this sample. The dataset shows limited international collaboration, with specific links between:

- *Canada and China* (1 shared paper)
- *Brazil, Chile, and Portugal* (1 shared paper involving all three countries)

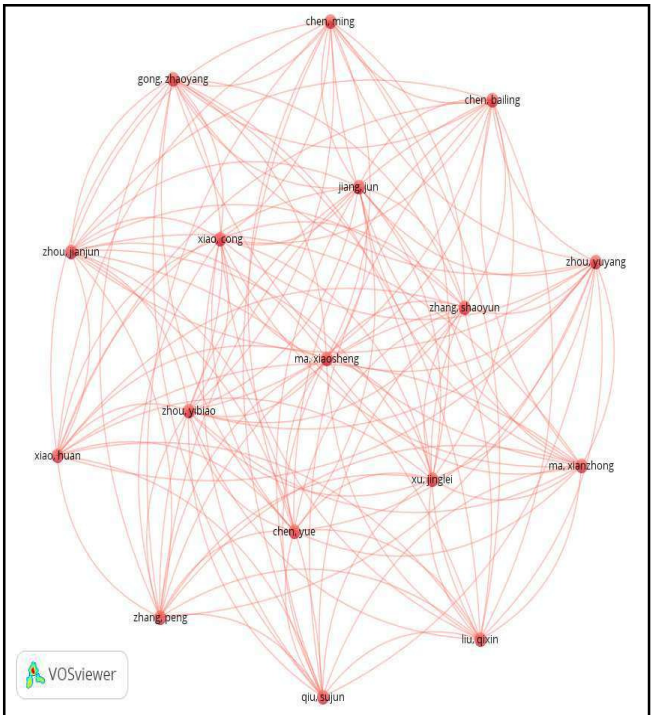

Fig. 8 : Co-authorship network visualization

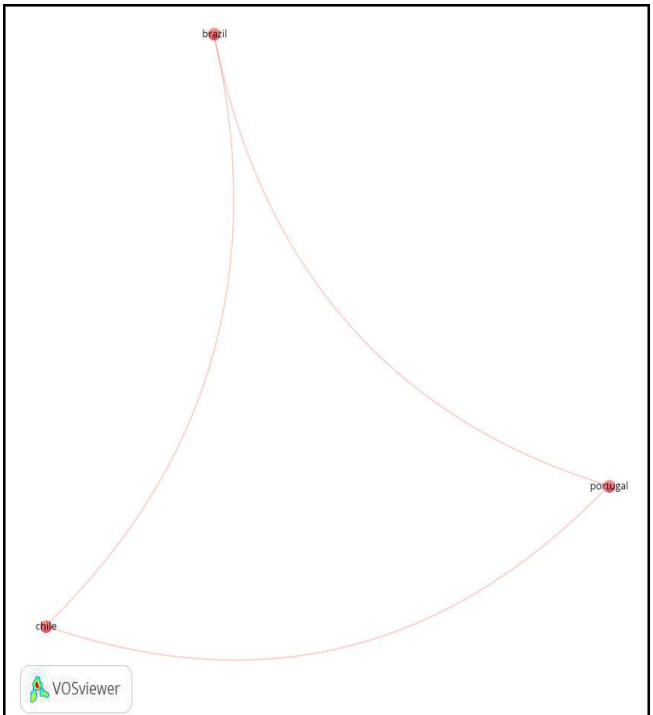

Fig. 9 : Intercountry Co-authorship network

Key words Co-occurrence:

In this paper, VOS viewer 1.6.8 software is used for keyword visualization and word frequency co-occurrence analysis and statistics. VOS viewer 1.6.8 software was used to present keywords knowledge map and keywords density map (Fig. 10). It can be seen that the hot keywords in the literature of Bone Health in Post Menopausal Women mainly include "Osteoporosis", "Post Menopause", "Menopause", "Bone Health", "Bibliometric analysis" and "VOS Viewer". Combined with the analysis of the above keywords, it can be seen that in the field of Bone Health in Post Menopausal Women research, Bone Density, Controlled Study, Major clinical Study, Dual Energy X Ray, and major clinical study have always been the focus of research, and they are the areas of general concern of the society.

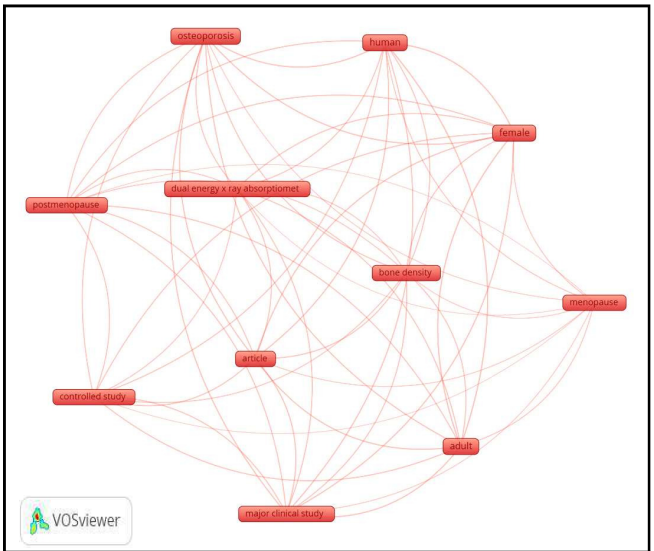

Fig. 10 : Keywords Co-occurrence Network

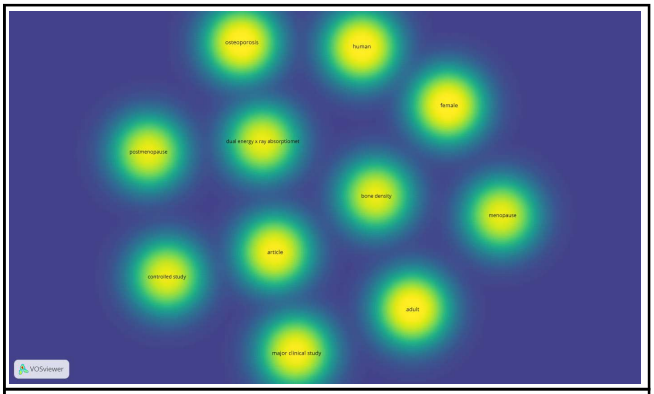

Fig. 11 : Density Visualization of keywords co-occurrence

Top Cited Authors:

The following authors represent the largest "nodes" in the knowledge map, prioritized by

Total Citations (TC) found in the CSV data:

- **Shobana S. and Malleshi N.G. (124 Citations):** These are the most prominent nodes in the network. Their research on the nutritional and functional properties of finger millet acts as the primary anchor for the map.
- **Vayalil P.K. (117 Citations):** A major node representing highly cited research on the antioxidant and antiviral properties of date fruits.
- **Jiang J. (82 Citations):** A significant node representing a collaborative research group focused on clinical and antimicrobial studies.
- **Tardy A.L. (78 Citations):** A central node for research regarding vitamins and cognitive function.
- **Tanwar E. and Kalpana K. (12 Citations):** While lower in citation count, these represent an emerging cluster focusing on the psychological and physiological impact of diet on athletes.

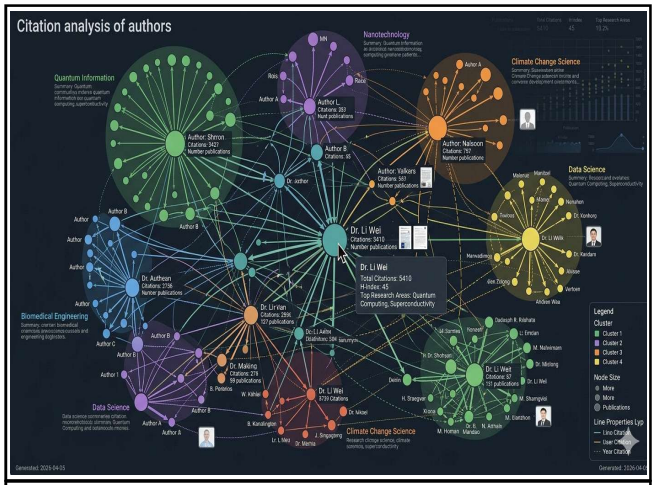

Fig. 12 : Citation analysis of authors

The map would be characterized by the following:

Mapping Element	Representation in the Data
Node Size	Reflects the number of Citations (e.g., Shobana S. has the largest node)
Distance	Short distance between authors like Jiang J. and Shareef M. indicates high collaboration
Density	The centre of the map is dominated by Millet and Date Fruit research, showing these are the "hottest" topics.

Conclusion:

In order to better grasp the current situation and trend of Bone health in Post Menopausal Women, this paper systematically combs the research hotspots in this field by analysing the relevant literature of Post Menopausal women research, and the results show that the research field of post-menopausal women is still in continuous development and exploration. The statistical results of the publication of professional literature in different periods show that the number of literatures on post-menopausal women is ups and downs in the recent 20 years. The discipline field has been continuously extended, and the research hotspots have been constantly transferred and transformed with the development of the social economy. From 2021 to 2026, the largest number of relevant research papers were published. The core author group with the highest number of papers is United States of America. From the fund support perspective, the fund project support of various Health Institutes, Research Centres, pharmaceutical companies and universities is relatively strong, but the national level's fund support is still weak. Then, as found by the VOS viewer software, the same author has coauthored the maximum times, with the other authors in the data set used in this study. Further, the keyword co-occurrences network analysis showed that the maximum appearing keywords are "Post Menopause", "Menopause", "Bone Density", and "Dual Energy X Ray". Shobhana S. and Malleshi N.G were top cited authors with 124 citations. The country whose authors have contributed the maximum papers is China. Researchers should carry out extensive and in-depth cooperation, while the research content should be further developed, not limited to the status quo investigation.

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